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Thermopane

REGISTERED

U. S. PATENT OFFICE

Glass, Insulators

THE FRANKLIN INSTITUTE

LIBRARY

A TRANSPARENT
INSULATING GLASS UNIT FOR
HOMES AND OTHER TYPES OF BUILDINGS



LIBBEY·OWENS·FORD GLASS COMPANY . . . TOLEDO, OHIO



The insulating properties of Libbey-Owens-Ford *Thermopane* are especially desirable in the home of Mr. and Mrs. Ralph Daudt which overlooks Lake Erie north of Toledo, Ohio. *Thermopane's* transparent, built-in insulation makes possible larger window areas without penalty of excessive heat loss in winter. Mr. Daudt designed his lake front residence.

South walls of triple *Thermopane* in the Glenview, Illinois, residence of Mr. and Mrs. H. M. Sloan admit eye-saving daylight and retain free heat received from the sun. Architect George Fred Keck used louvers below stationary wood sash to admit weatherproof ventilation.



Thermopane

REGISTERED U. S. PATENT OFFICE

THE WINDOWPANE THAT INSULATES

With the Patented BONDERMETIC SEAL

★ CLIMAXING MANY YEARS of research, *Thermopane* is the first successful windowpane ever made with built-in insulation. *Thermopane* is made of two or more panes of glass, separated by dehydrated air, and sealed around the edges at the factory with a patented metal-to-glass bond. In the Libbey-Owens-Ford laboratories, this Bondermetic Seal has withstood tests of over 1,000 pounds per square inch—dramatic proof of its amazing strength.

Thermopane is installed in a modified single sash, just as is regular window glass. But there the similarity of the two types of windowpanes stops, for *Thermopane*,

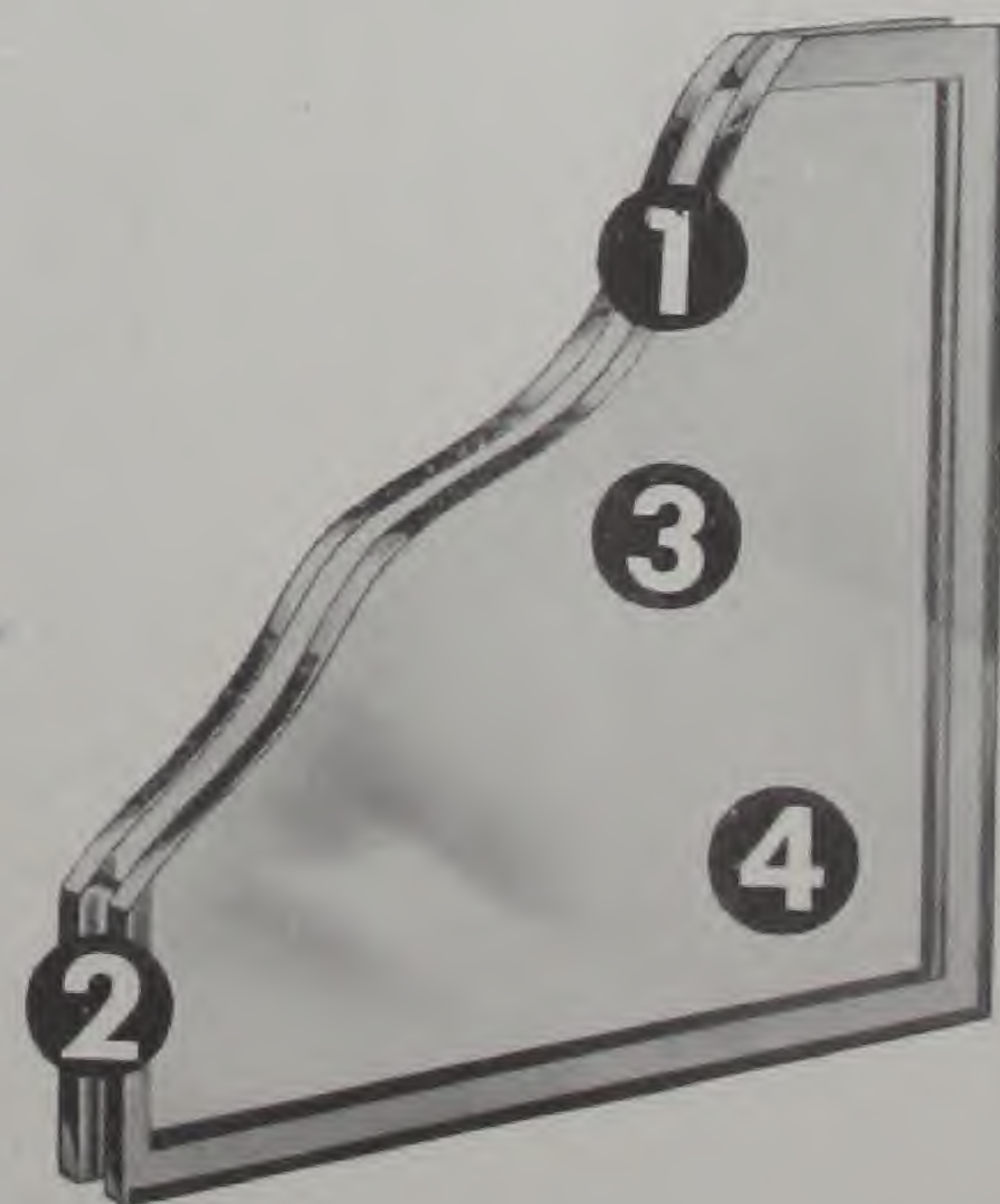
with its multiple-pane construction, keeps homes warmer in winter, cooler in summer and reduces heating and air conditioning costs.

Thermopane makes possible an entirely new standard of comfort and economy. All the benefits of double-glass insulation are enjoyed without the seasonal problems of putting up and taking down extra sash. There is no *extra* glass to keep clean because the patented Bondermetic Seal guards against infiltration of dirt and moisture. *Thermopane* makes it possible for buildings to have larger windows for admission of adequate natural daylight without sacrificing heating economy.

4 IMPORTANT FEATURES OF THERMOPANE

Compared with single glass glazing, the four important features of *Thermopane* are:

- ① *Greater year-round insulation* against cold and heat. Makes living conditions more healthful and comfortable. Saves fuel.
- ② *L·O·F's Bondermetic Seal.* This metal-to-glass seal bonds the panes of glass into one unit to guard against dirt and moisture entering the dry air space.
- ③ *Clearer Vision.* The sealed-in dry air greatly reduces the possibility of condensation on the glass.
- ④ *Only Two Surfaces to Clean.* The glass surfaces inside a unit are specially cleaned at the factory.



Thermopane

REGISTERED U. S. PATENT OFFICE

... PROVED IN THE RESEARCH LABORATORY AND IN VARIED INSTALLATIONS

★ THE INITIAL IDEA for a product which preceded *Thermopane* in its present form was conceived in a street car on a cold winter morning many years ago. A refrigeration engineer on his way to work noted the frost that covered the trolley windows and blocked out store display windows along the route. He was aware, of course, that engineers and inventors for years had sought to develop a glass construction which would eliminate condensation and frost on the windows of retail business places. He considered the home problems of deteriorated window sills, ruined wallpaper and draperies, caused by water running off the panes. He knew, too, that for years people had tried to solve the problems of double glazing with crude and makeshift devices.

From his early experiments came a unit consisting of two lights of glass using a rubber gasket separator strip to provide the insulating air space.

After years of experimentation and testing without success thousands of materials and combinations of materials, it was evident that an organic seal would not assure permanent efficiency. Research then took the direction of a glass-to-metal seal—an achievement in glass technology. A fellowship was established at Mellon Institute . . .



A lovely Picture Window of *Thermopane* adds to the charm of this dining room in the home of William J. Grede, Elm Grove, Wisconsin. The architect, Walter A. Domann, proves that the newest in window treatment blends beautifully with period furnishings.



hundreds of experiments were conducted over a period of three years, to perfect a metal-to-glass bond to seal the edges of the panes of glass. Finally, in 1937, Libbey-Owens-Ford technicians, after an exhaustive series of tests, approved the now patented *Bondermestic Seal*—the development which makes possible *Thermopane's* amazing properties. Because the metal used between the two lights of glass to obtain the desired air space is flexible, temperature and atmospheric pressure changes are cushioned.

Repeated laboratory tests proved that *Thermopane* was practical. But results of actual field trials were sought before Libbey-Owens-Ford technicians were ready to place their final stamp of approval on *Thermopane* and introduce it to the public for building construction. Therefore, hundreds of installations were made in various sections of the United States and Canada and their performance studied.

Thermopane Proves Worth at Little America

One of the most dramatic tests of the perfected *Thermopane* units was made at Little America by Rear Admiral Richard E. Byrd who used 36 triple *Thermopane* units to glaze the expedition's laboratory.

A radiogram from Little America reported:

"Superior to any windows I have ever seen installed in Antarctica and permit almost perfect visibility at temperatures down to at least 75 degrees below zero, with a room temperature of 75 degrees inside, or a temperature gradient of 150 degrees."

An idea of *Thermopane's* insulating value may be gained from the fact that a unit made of two $\frac{1}{4}$ " panes separated by $\frac{1}{2}$ " air space is equivalent to an 8-inch brick wall.



This *Thermopane* Picture Window in the home of C. H. Wickham of Mattituck, Long Island, withstood a direct wind which reached a velocity of between 75 to 100 miles per hour. The double-glass *Thermopane* unit provides insulation and year-round clear vision.

Thermopane Proves Efficiency In Test Chambers

Thermopane can be made with as many panes of glass as are necessary for the insulating job required—seven and even more panes are used in technical laboratory testing chambers for abnormally low temperature and humidity conditions. *Thermopane* used as observation windows in such laboratory equipment has withstood accelerated changes from saturated jungle-like humidity to Death Valley dryness—from 150° desert heat to -100° sub-stratosphere cold.

Thermopane Protects Foods

An example of *Thermopane's* outstanding insulating versatility is its use in the commercial refrigeration field. Thousands of meat and frozen food display cases and show windows are *Thermopane* equipped to protect perishable foods which must be kept at constant low temperatures.

Condensation is minimized on the roomside glass surface under normal humidity conditions with *Thermopane*. The dry captive air in the unit greatly reduces the possibility of condensation between the panes. Consequently clearer vision with *Thermopane* windows is a direct result from diminishing steaming and frosting.

Thermopane Eases Air Conditioning Costs

Engineers know that single glazing is unsuitable for efficient operation of air conditioning equipment, since it is impossible to maintain adequate humidity for comfort requirements in winter without condensation occurring on the roomside surface of the



Here's a lovely bedroom Picture Window of insulating *Thermopane*. Ventilation is provided through the louvered openings at top and bottom. Other windows in this Green's Ready Built home in Rockford, Illinois are also *Thermopane* units to provide excellent daylighting and full view of the out-of-doors and children at play. Architect—George Fred Keck.



glass. By reducing condensation and heat transmission with the use of *Thermopane*, more accurate calculation and equipment design is possible and the result is lower initial cost, better performance and economy of operation.

Thermopane made with two panes of glass is generally suitable for glazing windows and doors in all buildings which require heating or air conditioning. *Thermopane* made with more than two panes of glass is available for use where unusually severe conditions are encountered.

What Does *Thermopane* Do For You?

Now that the home owner has a fairly sound idea of the features, construction and possibilities of *Thermopane* windows, he will be interested in what it will do for him. Basically, *Thermopane* adds to the year-round comfort a home can offer. Other important features are:

Thermopane helps maintain healthful humidity conditions.

Thermopane eliminates the drudgery of putting up and taking down extra sash as well as storing, repainting and reglazing them.

Thermopane makes larger window areas practical giving more light, clear vision and the proper framing of lovely outdoor views.

Thermopane reduces heating and air conditioning costs.

Thermopane minimizes water dripping from windows which deteriorates sills and floors and soils draperies, carpets and wall decoration.



This window stands the brunt of northeast gales from Lake Superior —yet the owners, Mr. and Mrs. J. J. Wille, Duluth, dine in comfort. Insulating *Thermopane* keeps heat in, provides an unobstructed view regardless of the difference between room and outdoor temperature. Architect Otto M. Olsen, Duluth, used five other *Thermopane* windows in the home.

LOOSE-WILES BISCUIT COMPANY

BAKERS OF SUNSHINE BISCUITS



851—FIFTY AVENUE
Oakland, Calif.

August 31, 1943

Mr. Frank Hawkins,
c/o Liberty-Cross-Ford,
Nicholas Bldg.,
Toledo, Ohio

Dear Sir:

We are pleased to inform you that the use of your double glass Thermopane insulation window panes has proven entirely satisfactory. Hammered Aklo heat absorbing and glare reducing tinted glass was used to form the Thermopane panels. These units were then installed in our steel sash windows at various locations throughout the building, this procedure being followed wherever it was necessary to maintain a uniform year round temperature to permit satisfactory baking conditions and processing of our various types of crackers and cookies manufactured at the Oakland Sunshine Biscuit Plant.

The general appearance and effect is pleasing and, in addition, has resulted in a saving in reduced operating cost of our air conditioning system and elimination of condensation on the room side of the building walls.

Yours very truly,

LOOSE-WILES BISCUIT COMPANY

J. J. Flynn
Manager

JGP:JS



DAYLIGHT ENGINEERING BUSINESS

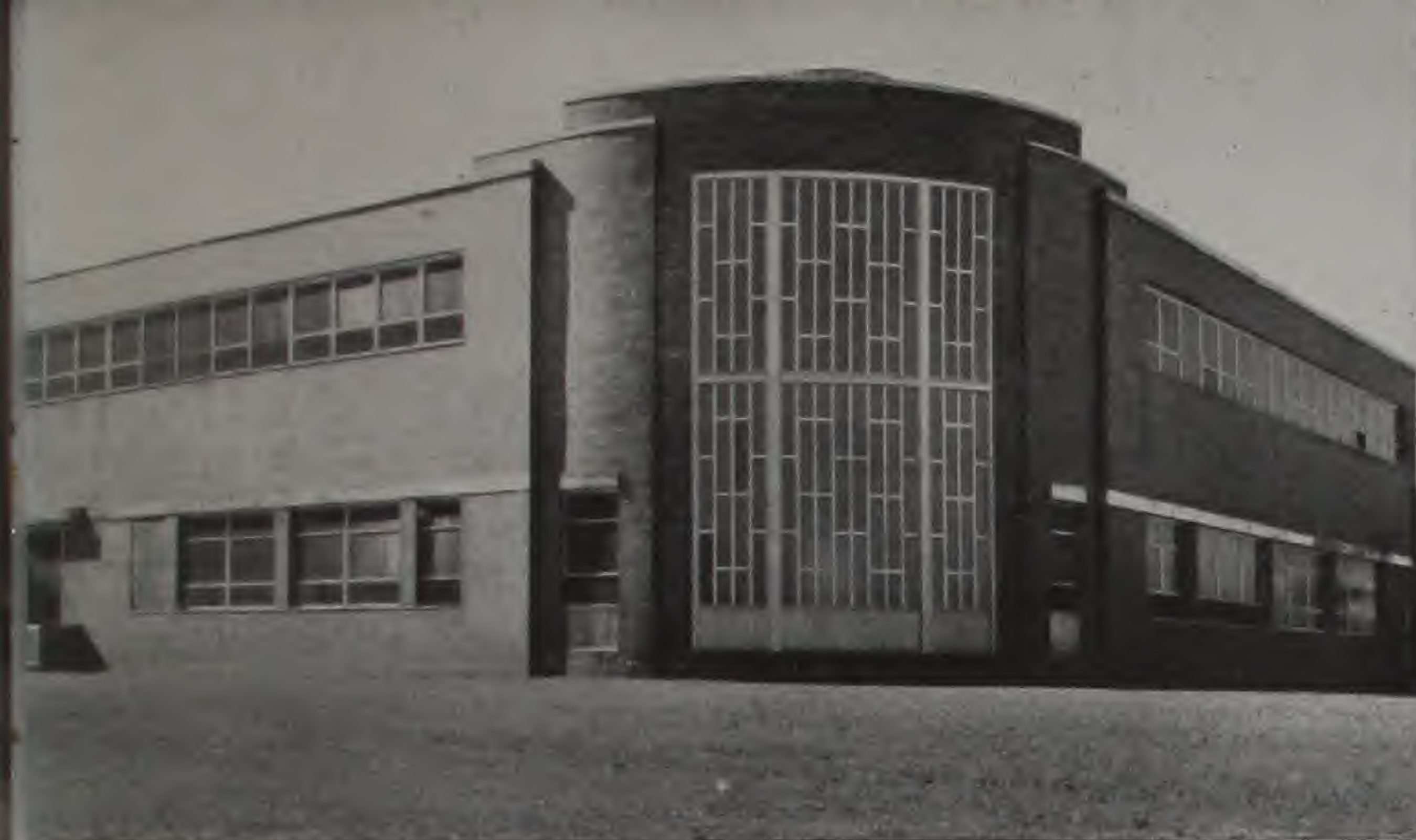
★ The use of *Thermopane* is not limited to homes. Pictured on these two pages are industrial and commercial buildings of diversified function in which the transparent double-glass units are serving satisfactorily.

Thermopane can be furnished in special forms to meet particular problems. For example, the Loose-Wiles Biscuit Company, Oakland, Calif., had units factory-fabricated with an outside pane of sandblasted Blue Ridge Hammered Aklo Heat



All pictures on this page are of the Loose-Wiles Biscuit Company in Oakland, Calif. Architects M. C. Haley and C. W. Watkins specified use of 420 14" x 20" *Thermopane* units, fabricated with a heat absorbing glass to keep temperature inside at 80 degrees winter and summer. The glass was installed in September of 1940.





↑ Thermopane units with both panes of Flutex glass create an interesting window in the Canada Dry plant at Montreal. One pane in each unit is set with flutes running vertically while the other pane is glazed so that flutes are horizontal. This type *Thermopane* provides privacy plus insulation and daylight. Employees can work close to this large glass area and receive benefits of natural daylight without discomfort from cold. Architects — Luke and Little, Montreal, in association with regular United States company architects.

Architects Dale McEnary and Edwin Krafft specified *Thermopane* for the Farmers and Mechanics Savings Bank of Minneapolis and the attached office building. This installation is unique, since Flutex figured glass was used as the outside pane in the units.

↑ The home of Canada Packers, Inc., Winnipeg, features a *Thermopane* window four stories high (shown from the exterior in lower right). The window not only keeps the stairwell warmer by retaining heat but assures a well lighted stairway to guard against accidents. ↓

BUILDINGS WITH THERMOPANE

Absorbing Glass. A uniform year-round temperature is maintained for satisfactory processing and baking.

A building whose contents would be harmed by fading can reduce its losses by using *Thermopane* fabricated with an outer pane of Libbey-Owens-Ford Golden Plate Glass, which reduces transmission of the ultraviolet rays in sunlight. Where a view is unattractive, diffused light can be provided with visibility reduced or completely obscured by using, respectively, a clear or sandblasted figured glass in the *Thermopane* unit.



Eighteen large *Thermopane* units, each with one pane of Heat Absorbing Plate Glass, were installed in the new office quarters of the Kansas Milling Company, Wichita, Kansas. Architect — Lorenz Schmidt, Wichita, Kansas.





When the building which houses the Business Institute of Milwaukee was constructed in 1941 by Ticonic Investment Co., the continuous window openings on three sides of the structure were fitted with *Thermopane* in fixed wood sash. Classrooms are flooded with daylight without the penalty of heat loss and disturbing outside noise is deadened by the *Thermopane* glazing.

BUSINESS INSTITUTE

Milwaukee

1000 WEST WISCONSIN AVENUE
MILWAUKEE, WIS.

August 20, 1940

COMMERCIAL GLASS COMPANY
Chicago, Ill.

Sir:

We spent quite a good portion of time in 1939, 1940, and 1941 in the East and West visiting schools in which we found the *Thermopane* (insulating glass) with wood sash and double sashage all over the place and found it was everywhere with the *Thermopane* product of Commercial Glass Company. We were so much impressed that I would like to see it again without a doubt we shall use *Thermopane*.

Our classrooms have installed windows that have let us experience the best of both worlds. We have seen the great amount of light and warmth that the school has to offer.

I have noticed, too, that the schools that used *Thermopane* (insulating glass) were not only better for the students but also for the teachers.

Sincerely and respectfully yours,

S. B. Traisman,
President, Business Institute of Milwaukee

S. B. Traisman, president of the Business Institute, who endorses *Thermopane* in the letter on the left, is so pleased with the product's performance in the school which he heads that the two upper floors have been leased for 25 years.

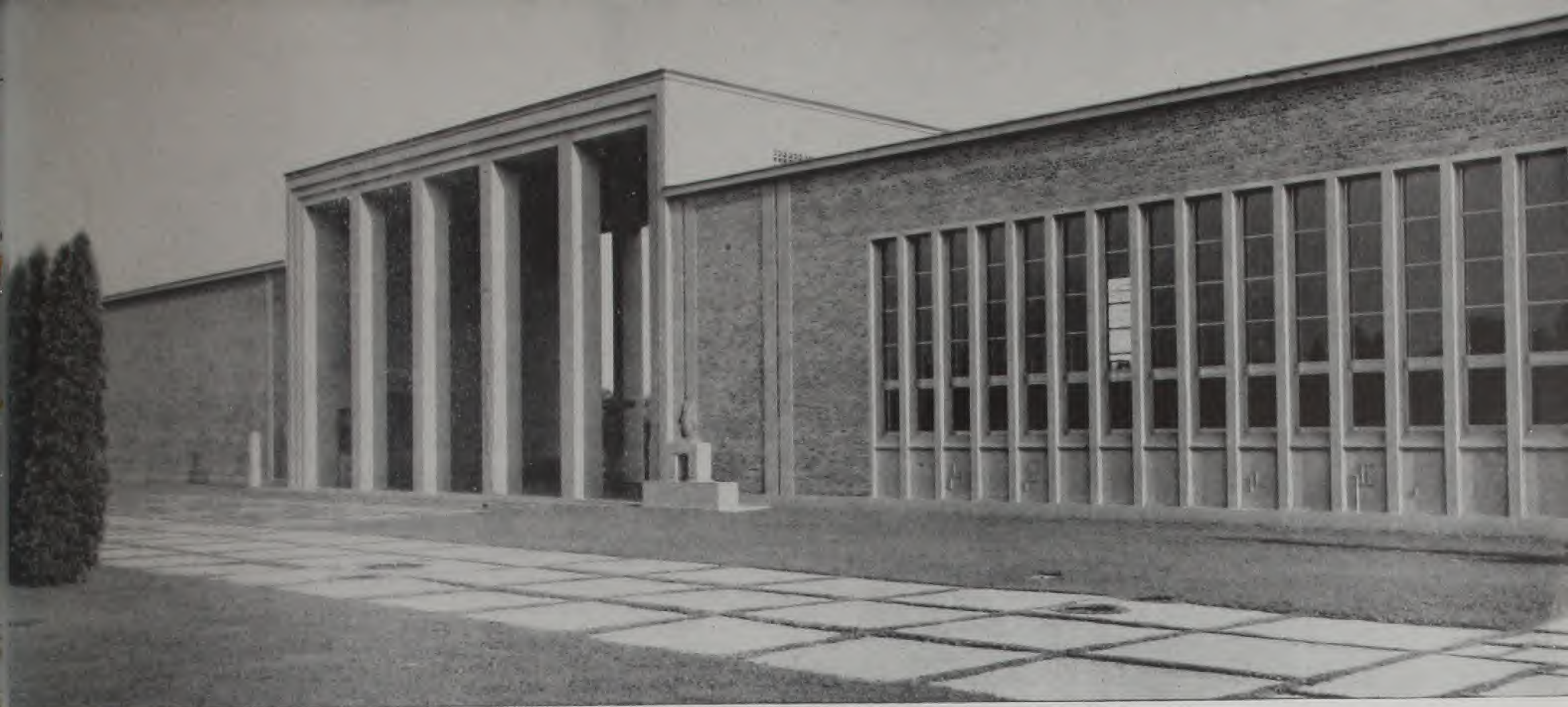
DAYLIGHT ENGINEERING SC

★ When *Thermopane* is used in schools, classrooms are warmer with more even temperature throughout. Pupils can sit near the outside wall and enjoy the benefits of natural daylight without the chill experienced with single glazing in cold weather.

A *Thermopane* unit consisting of two panes of $\frac{1}{4}$ " Polished Plate Glass with $\frac{1}{2}$ " air space has other advantages for schools since it helps materially to reduce the noise heard through single glass glazing . . . helps pupils concentrate, learn faster, think more clearly. The cost of heating a school building is reduced with *Thermopane* which prevents a large percentage

Plans for an addition to Rogers School, Glenview, Illinois, were altered to incorporate *Thermopane* windows so that pupils could enjoy the benefits of transparent, insulating glass units. The architects for this modern school are Perkins, Wheeler & Will, Chicago.





Excessive condensation on two large windows in the Library of Cranbrook School, Bloomfield Hills, Mich., prompted a test of a *Thermopane* unit during the winter of 1942-'43. Satisfied by the unit's performance in a north window, all regular glass in the library

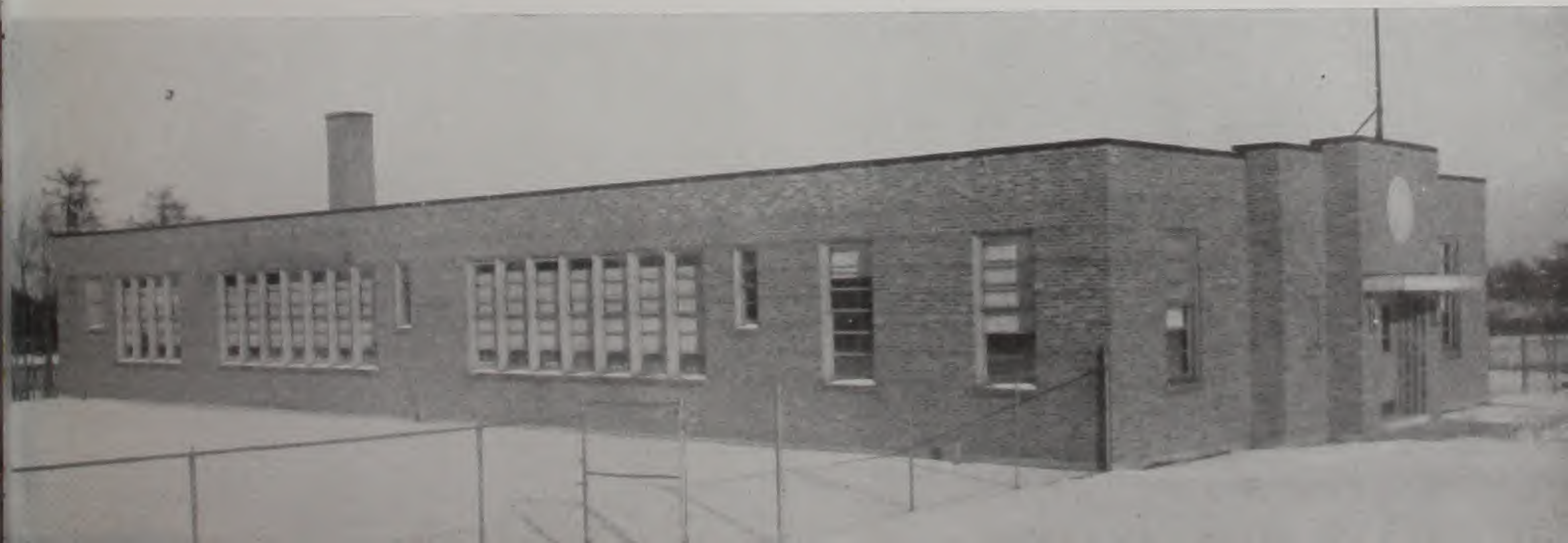
was replaced by *Thermopane* in August of 1943. John H. Buckberrough of the Cranbrook Foundation says: "*Thermopane* has been installed in the large north window containing 60 lights, each measuring $29\frac{1}{2}$ " x 30", and in a window on the south side of the building which has seven lights, each 58" x $27\frac{1}{2}$ ". Besides correcting our condensation problem, we find that *Thermopane* has great insulating benefits." Eliel Saarinen, architect.

SCHOOLS WITH *THERMOPANE*

of the heat loss occurring through single glazing. Maintenance expenses are lessened, also, for *Thermopane's* dead air space minimizes, under normal humidity conditions, condensation which streaks walls below window openings glazed with one pane of glass.

Thermopane is suitable for all types of schools in every climate. The letter at the left and remarks which accompany pictures on this page, relate the satisfaction of school officials who have had an opportunity to observe *Thermopane's* performance carefully at close range.

"*Thermopane* is one of the best features of the Mountsfield School", states J. C. Graham, chairman of the board of this rural consolidated school near London, Ont. "Pupils can be seated near the windows without discomfort from cold. The school is very economical to heat and temperatures are easily maintained. In this connection, *Thermopane* has almost paid for itself in three years. Adequate lighting is a further factor. The teachers are pleased that such big windows are possible without loss of warmth."





The letter below describes *Thermopane's* capable performance in the Whitefish Bay (Wis.) State Bank designed by Architects Grossold & Johnson. Temperatures range from -25° to 95° in an average year in the eastern Wisconsin community.

The beautiful scene above was taken inside the Octagon House, atop Mt. Mansfield, Vermont's highest mountain. Comfort for armchair ski enthusiasts is assured with five large double-glass *Thermopane* windows. Outside temperature was 19° below zero when this photo was taken.

WHITEFISH BAY STATE BANK WHITEFISH BAY, WISCONSIN

G. E. JOHNSON, EXECUTIVE VICE PRESIDENT
W. E. SWAN, CHAIRMAN

July 13, 1943

Libbey-Owens-Ford Glass Co.,
Nicholas Building,
Toledo 3, Ohio

Gentlemen: Attn: Mr. Frank E. MacCine

When we planned our new bank building in the fall of 1941, we specified *Thermopane* for the large front window because we realized the necessity of double glass insulation. This window faces north and is quite exposed. It was a difficult window to equip with wood storm sash without spoiling the architectural effect, and such storm sash would have been so large that they would have presented quite a problem in handling and summer storage.

Our *Thermopane* installation has worked out very well. We have had no trouble whatever with condensation and have also noticed that the *Thermopane* seems to deaden outdoor noise.

Very truly yours,

G. E. Johnson
G. E. Johnson
Executive Vice President

THERMOPANE SETS NEW STANDARD FOR

★ Larger windows in homes, schools, hospitals and all types of office and commercial buildings are now practical with *Thermopane*. For *Thermopane* keeps interiors warmer in winter and cooler in summer.

Thermopane is built-in, year-round insulation which is glazed into wood or steel sash like a regular pane of glass. Scientific cleaning and drying of the air, hermetically sealed into *Thermopane* units during manufacture, assures clearer vision.

An entire wall of *Thermopane* makes this drafting room "easy on the eyes". Frank Stepnoski & Son, Fond du Lac, Wisconsin were the architects responsible for this modern office of the Giddings & Lewis Machine Tool Co. All office windows were glazed with *Thermopane* double-glass insulating units.





When the offices of the president of the Crawford Furniture Mfg. Corp., Jamestown, New York were remodeled three *Thermopane* windows were installed. According to Mr. Davis, Purchasing Agent, the noise from the dimension mill directly across the court was greatly reduced.



Abundant daylight without uncomfortable drafts is provided employees of Jerpe Commission Co. by the large *Thermopane*-glazed windows. Even in winter, non-frosting glass permits a clear view constantly of operations on the loading dock.

COMFORT, CONVENIENCE AND ECONOMY

Rooms and offices glazed with insulating *Thermopane* are more comfortable to the occupant even close to windows in sub-zero temperatures. The whole space is usable and livable. Interiors are quieter, too, because of the two panes of glass which reduce outside noise.

Thermopane sets a new high for the worth of a window. It's designed to keep pace with better building materials which will make daily living more enjoyable. When "window-shopping" think of *Thermopane*—the insulating window pane.



With batteries of clothing presses in operation, considerable humidity presented a problem for the Tip Top Tailoring organization in Toronto, Canada. The problem was solved when all windows in the western elevation (except for those in the towers) were replaced with *Thermopane* set in wood sash.

JOHN LATENSER, JR.
FRANK LATENSER

JOHN LATENSER & SONS
ARCHITECTS & ENGINEERS
ESTABLISHED 1885

1307 FARNAM STREET
OMAHA (4) NEBRASKA

December 30, 1943

Libbey-Owens-Ford Glass Company
Nicholas Building
Toledo, Ohio

Gentlemen:

We watched with interest the preliminary announcement of your development of "Thermopane" which produced two pieces of glass with an air space between which was permanently sealed against moisture and dust. We were glad to have had the opportunity of making one of the early installations of "Thermopane" in the Jerpe Commission Company office building, Omaha.

This building has year-round air conditioning. "Thermopane" has definitely resulted in a considerable saving in heating and cooling costs and the "Thermopane" windows allow year-round executive observation of the loading dock and factory building located across the street without the interference of frost or condensation on the glass in summer or winter.

We believe your "Thermopane" is an outstanding advancement in the construction industry.

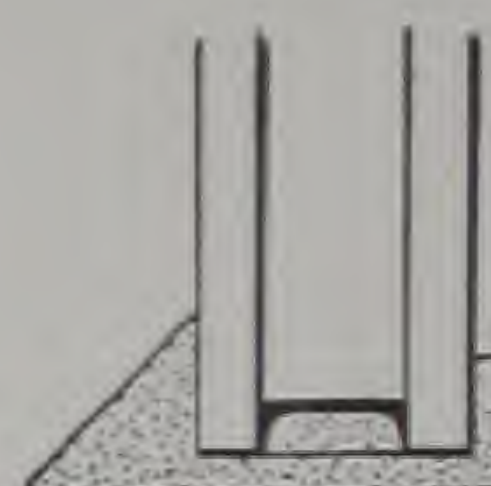
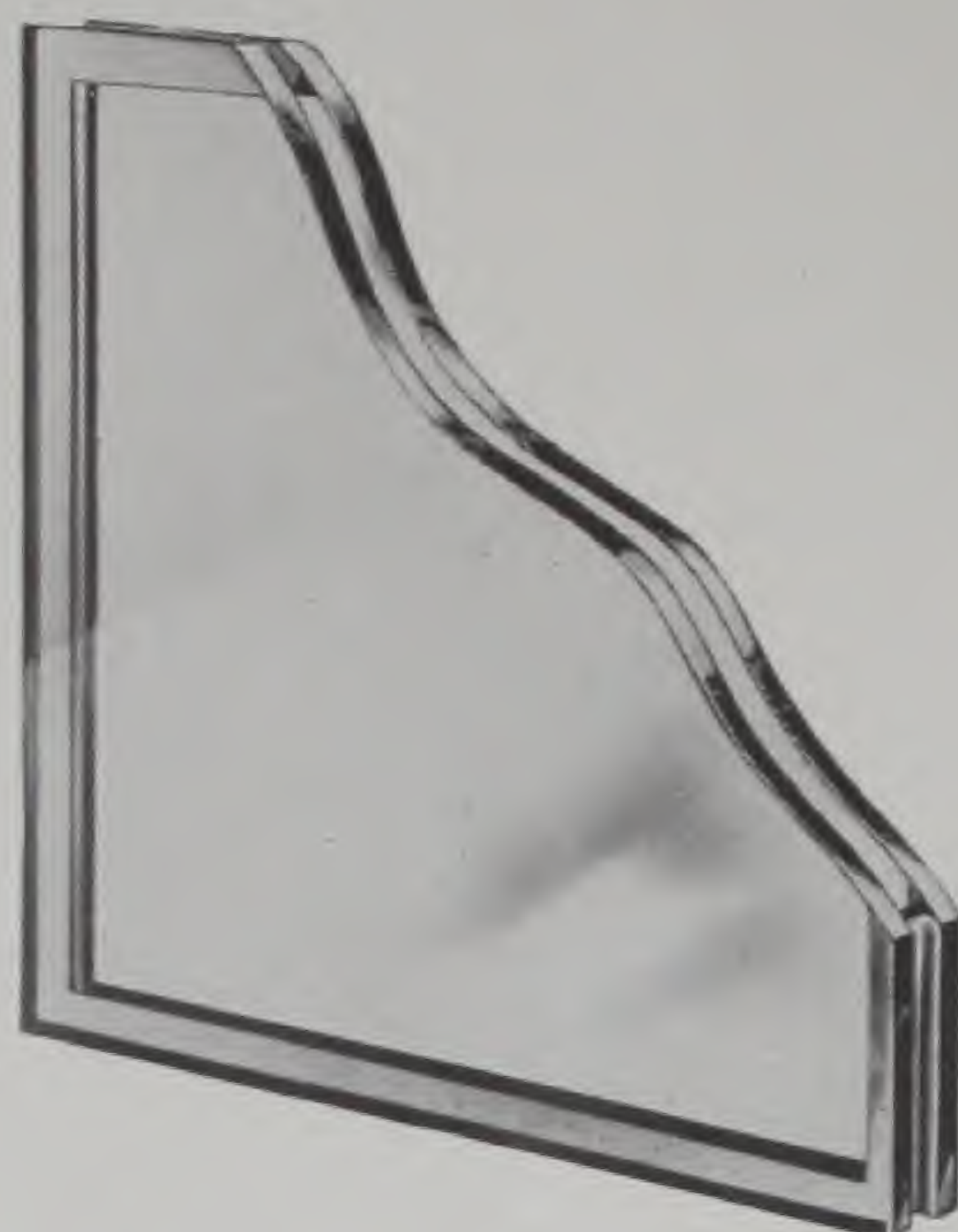
Sincerely

JOHN LATENSER & SONS

By *Frank Latenser*
Frank Latenser

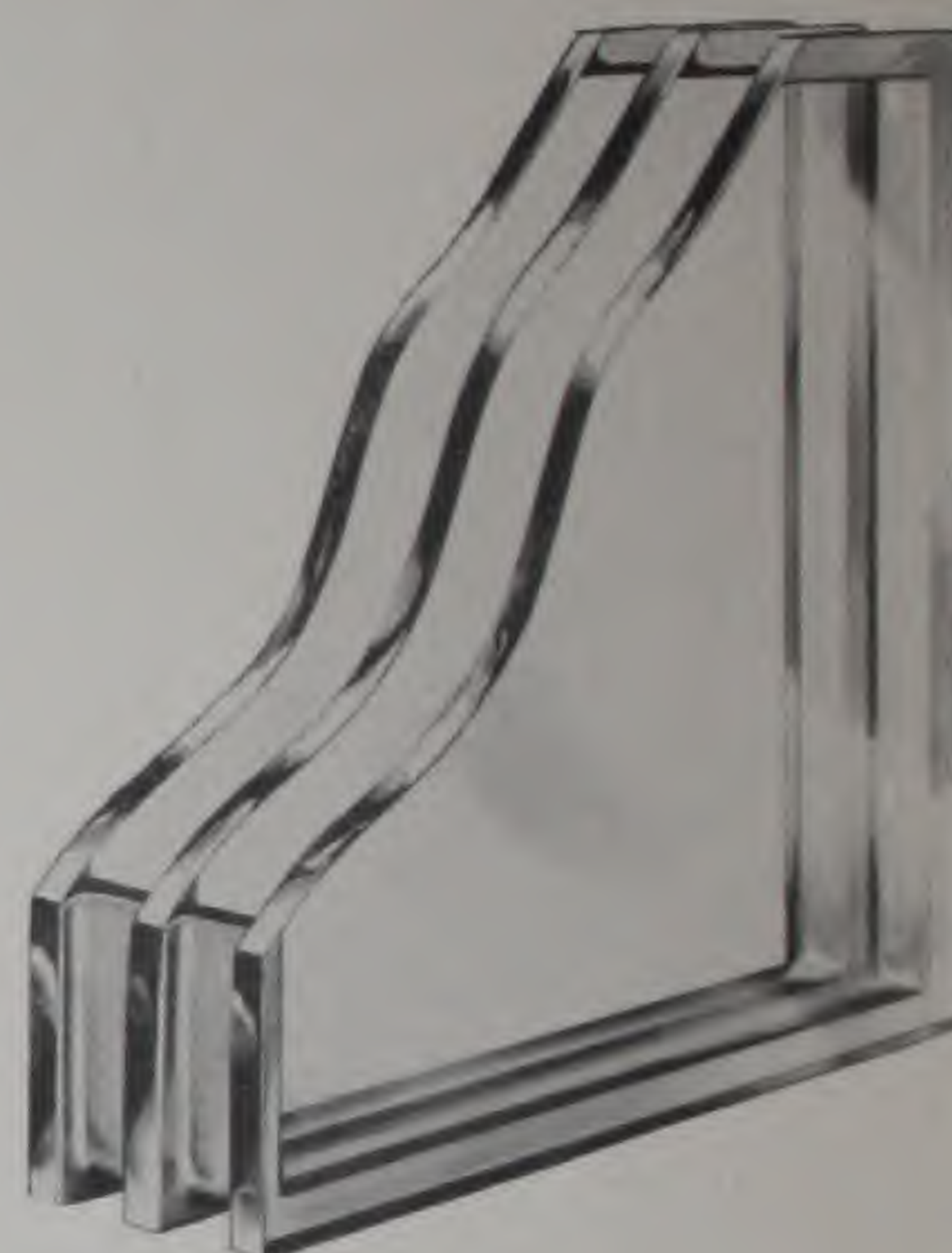
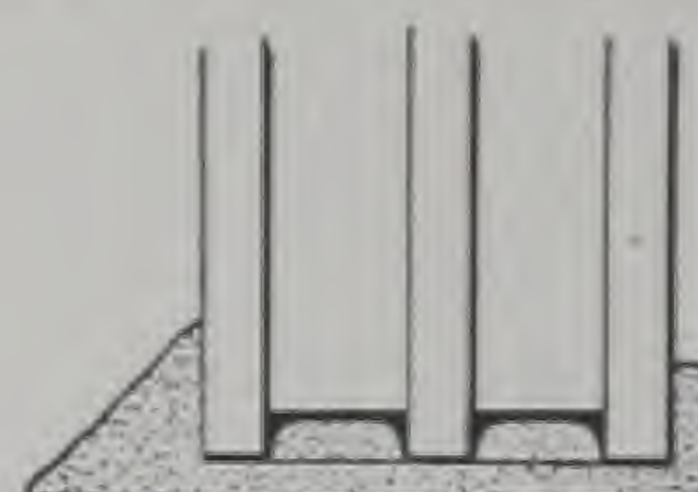
FL:BJ

Thermopane TECHNICAL DATA



LEFT and ABOVE are shown cutaway and edge views of double *Thermopane*. Dotted area indicates putty used in setting.

RIGHT and BELOW are sketches of triple *Thermopane* whose extra pane of glass and air space increase the unit's insulating value



HEAT LOSS TRANSMISSION

Thermopane units provide a high resistance to heat flow, varying with the number of panes and the thickness of the air space used. In summer the low heat transmission coefficient reduces the load on air conditioning systems. In winter it saves heat. The greater efficiency of *Thermopane* makes it possible to incorporate larger windows in houses and keep the cost of fuel constant. For example, a house could have 114 square feet of *Thermopane* instead of 62 square feet of single glazing and not lose any more heat. *Thermopane* permits the influx of solar heat in exterior glazing of buildings without a prohibitive compensating loss from conduction.

HEAT TRANSMISSION DATA

Based on 0° outside, 70° inside, 15 mph outside, .25 mph inside.

Number of Panes	Thickness of Panes	U Values	
		1/4" Air Space	1/2" Air Space
2 (Double <i>Thermopane</i> — one air space)	1/8"	.62	.57
	1/4"	.57	.53
3 (Triple <i>Thermopane</i> — two air spaces)	1/8"	.42	.37
	1/4"	.39	.35

Note: U for single 1/8" thick glass=1.14, R=0.88
U for single 1/4" thick glass=1.07, R=0.94

SASH INFORMATION

Standard double hung or casement wood sash are usually 1 3/8" thick and do not have sufficient rabbet width to accommodate the standard *Thermopane* unit manufactured with two lights of 1/8" glass and 1/4" air space.

When *Thermopane* is used in any movable wood sash, slightly heavier construction is needed because of both added thickness and weight. Wood sash details are available upon request.

Most standard steel sash will accommodate standard *Thermopane* units.

A rabbet width of 7/8" or 1" is required in either wood or steel sash.

THERMOPANE WARRANTY

For a period of five (5) years from date of shipment from our factory, we warrant that under normal conditions, material obstruction of vision resulting from film formation, or dust collection between the interior glass surfaces of *Thermopane*, will not occur.

This warranty will be void unless *Thermopane* is installed in accordance with our installation instructions, or if any cutting, fitting, or nipping of edges or corners, is done, accidentally or otherwise, after shipment from our factory, or if the unit is damaged in handling, installation or otherwise.

Our maximum liability under these warranties shall be the delivery of replacement lights of *Thermopane* to the railroad shipping point nearest the place of installation.

These warranties do not apply when *Thermopane* is used in railroad cars or other vehicles.

LIBBEY-OWENS-FORD GLASS CO.

DOUBLE THERMOPANE SIZES, THICKNESSES, TOLERANCES, WEIGHTS

Type of Glass	Min. Size $\frac{1}{4}$ " or $\frac{1}{2}$ " Air Space	Max. Size with $\frac{1}{4}$ " Air Space	Max. Size with $\frac{1}{2}$ " Air Space	Thickness Range		Dimensional Tolerance	Approx. Aver. Net Weight per Sq. Ft.
				$\frac{1}{4}$ " Air Space	$\frac{1}{2}$ " Air Space		
D. S. A. $\frac{1}{8}$ " Blue Ridge Figured $\frac{1}{8}$ " Plate $\frac{1}{8}$ " Color Clear* Plate $\frac{1}{8}$ " Heat Absorbing Plate	8" x 8"	32" Max. Width 76" Max. Length Length not to exceed $4\frac{1}{2}$ times width. Total Area 1400 Sq. In.	24" Max. Width 76" Max. Length Length not to exceed $4\frac{1}{2}$ times width. Total Area 1400 Sq. In.	$\frac{7}{16}$ " to $\frac{9}{16}$ "	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$+\frac{1}{16}$ " $-\frac{1}{16}$ "	3½ lbs.
$\frac{3}{16}$ " Sheet $\frac{7}{32}$ " Sheet	8" x 8"	42" Max. Width 72" Max. Length	42" Max. Width 72" Max. Length	$\frac{9}{16}$ " to $\frac{11}{16}$ " $\frac{5}{8}$ " to $\frac{3}{4}$ "	$\frac{13}{16}$ " to $\frac{15}{16}$ " $\frac{7}{8}$ " to 1"	$+\frac{1}{8}$ " $-\frac{1}{16}$ "	5 lbs. 6¼ lbs.
$\frac{1}{4}$ " Plate	8" x 8"	48" Max. Width. 132" Max. Length. Total Area 4800 Sq. In.	98" Max. Width. 132" Max. Length. Total Area 9600 Sq. In.	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$\frac{15}{16}$ " to 1"	8" to 36" wide $+\frac{1}{8}$ " $-\frac{1}{16}$ "	7 lbs.
$\frac{1}{4}$ " Color Clear Plate		48" Max. Width. 132" Max. Length. Total Area 4800 Sq. In.	70" Max. Width. 132" Max. Length. Total Area 9240 Sq. In.				
$\frac{1}{4}$ " Heat Absorbing Plate	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	70" Max. Width. 100" Max. Length. Total Area 7000 Sq. In.	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$\frac{15}{16}$ " to 1"	36" to 60" wide	7 lbs.
$\frac{7}{32}$ " Colored Plate $\frac{13}{64}$ " Plate	8" x 8"	48" Max. Width. 120" Max. Length. Total Area 4800 Sq. In.	60" Max. Width. 120" Max. Length. Total Area 6000 Sq. In.	$\frac{5}{8}$ " to $\frac{3}{4}$ "	$\frac{7}{8}$ " to 1"	$+\frac{3}{16}$ " $-\frac{1}{16}$ "	6¼ lbs.
				$\frac{9}{16}$ " to $\frac{11}{16}$ "	$\frac{13}{16}$ " to $\frac{15}{16}$ "		5½ lbs.
$\frac{7}{32}$ " Blue Ridge Figured	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	$\frac{5}{8}$ " to $\frac{3}{4}$ "	$\frac{7}{8}$ " to 1"		6 lbs.
Safety Glass: Sheet—D. S. + S. S. Plate— $\frac{1}{8}$ " + $\frac{1}{8}$ "	8" x 8"	32" Max. Width. 60" Max. Length. Total Area 1400 Sq. In.	32" Max. Width. 60" Max. Length. Total Area 1400 Sq. In.	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$\frac{15}{16}$ " to 1"	$+\frac{1}{16}$ " $-\frac{1}{16}$ "	7 lbs.
Safety Glass: Plate— $\frac{3}{16}$ " + $\frac{1}{8}$ "	8" x 8"	48" x 60"	48" x 60"	$\frac{13}{16}$ " to $\frac{15}{16}$ "	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$+\frac{1}{16}$ " — $\frac{1}{16}$ "	8½ lbs.
Tuf-flex* ($\frac{1}{4}$ ") in Polished Plate, Color Clear, Heat Ab- sorbing and Colored Plate	8" x 8"	40" x 48"	40" x 48"	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$\frac{15}{16}$ " to 1"	$+\frac{1}{8}$ " $-\frac{1}{16}$ "	7 lbs.

For building exteriors, sizes over 48" wide will be manufactured with $\frac{1}{2}$ " air space only.

TRIPLE THERMOPANE SIZES, THICKNESSES, TOLERANCES, WEIGHTS

Type of Glass	Min. Size	Max. Size with $\frac{1}{4}$ " Air Space	Max. Size with $\frac{1}{2}$ " Air Space	Thickness Range		Dimensional Tolerance	Approx. Aver. Net Weight per Sq. Ft.
				$\frac{1}{4}$ " Air Space	$\frac{1}{2}$ " Air Space		
D. S. A. $\frac{1}{8}$ " Blue Ridge $\frac{1}{8}$ " Plate $\frac{1}{8}$ " Color Clear Plate $\frac{1}{8}$ " Heat Absorbing Plate	8" x 8"	24" Max. Width Length not to Exceed $4\frac{1}{2}$ times width. Total area 1400 Sq. In.	$\frac{1}{4}$ " Air Space only	$\frac{13}{16}$ " to $\frac{15}{16}$ "		$+\frac{1}{16}$ " $-\frac{1}{16}$ "	5¼ lbs.
$\frac{3}{16}$ " Sheet $\frac{7}{32}$ " Sheet	8" x 8"	42" Max. Width 72" Max. Length	42" Max. Width 72" Max. Length	1" to $1\frac{1}{8}$ " $\frac{11}{16}$ " to $\frac{13}{16}$ "	$1\frac{1}{2}$ " to $1\frac{5}{8}$ " $\frac{19}{16}$ " to $1\frac{11}{16}$ "	$+\frac{1}{8}$ " $-\frac{1}{16}$ "	7½ lbs. 8¼ lbs.
$\frac{1}{4}$ " Plate	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 3200 Sq. In.	68" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.	$\frac{13}{16}$ " to $\frac{15}{16}$ "	$1\frac{11}{16}$ " to $1\frac{13}{16}$ "	8" to 36" wide $+\frac{1}{8}$ " $-\frac{1}{16}$ " 36" to 60" wide $+\frac{3}{16}$ " $-\frac{1}{16}$ "	10½ lbs.
$\frac{1}{4}$ " Heat Absorbing Plate	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 3200 Sq. In.	48" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.				
$\frac{1}{4}$ " Color Clear Plate	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 3200 Sq. In.	68" Max. Width. 100" Max. Length. Total Area 4800 Sq. In.				
$\frac{13}{64}$ " Plate	8" x 8"	48" Max. Width. 100" Max. Length. Total Area 3200 Sq. In.	60" Max. Width. 100" Max. Length. Total Area 4200 Sq. In.	$\frac{11}{16}$ " to $\frac{13}{16}$ "	$\frac{19}{16}$ " to $1\frac{11}{16}$ "	$+\frac{1}{8}$ " $-\frac{1}{16}$ "	8 lbs.

Thermopane also is manufactured in other multiple units.

Sizes, tolerances and weights furnished on request.

*REGISTERED U.S. PATENT OFFICE



L·O·F BRANCH OFFICES

Atlanta 3, Georgia 1010 Whitehead Building	Jackson 2324	Los Angeles 13, Calif. 905 Architects Building	Michigan 0854
Boston 16, Mass. 1437 Statler Building	Hubbard 0100	Memphis 3, Tenn. 1015 Farnsworth Building	5-8225
Buffalo 3, New York 1126 Rand Building	Cleve. 0291	Milwaukee 10, Wisc. 3121 N. 55th Street	Hilltop 3110
Chicago 3, Illinois 120 South Lasalle Street	Central 2490	Minneapolis 2, Minn. 506-7 Savings & Loan Building	Geneva 5464
Cincinnati 2, Ohio 1611 Carew Tower	Cherry 5246	New York 22, New York 570 Lexington Avenue	Eld. 5-1025
Cleveland 13, Ohio 1302 Terminal Tower Building	Main 7180	Philadelphia 2, Pa. 1528 Walnut Street	Penny. 8666
Dallas 1, Texas 1402 Tower Petroleum Building	Riverside 4026	Richmond 19, Va. 1122 Mutual Assurance Society Bldg.	3-3034
Denver 2, Colorado 414 Tramway Building	Tabor 8015	St. Louis 1, Missouri 411 N. Seventh Street	Garfield 5541
Detroit 2, Mich. 610 Fisher Building	Mad. 0080	San Francisco 5, Calif. 812 Rialto Building	Sutter 4360
Indianapolis 4, Indiana 724 Circle Tower	Franklin 1363	Seattle 1, Washington 210 Lloyd Building	Seneca 2513
Kansas City 6, Missouri 1004 Baltimore Street	Victor 5360	Toledo 3, Ohio Nicholas Building	Main 5291
Washington 5, D. C. 1010 Shoreham Building		Republic 4472	

LIBBEY·OWENS·FORD GLASS COMPANY
TOLEDO, OHIO

A Great Name in Glass